ARMY ENGINEER DISTRICT, SACRAMENTO SPK-03362
CORPS OF ENGINEERS Sep 86
SACRAMENTO, CALIFORNIA Revised Apr 89

TO: Architect-Engineers and District Personnel:

1. The attached revised guide specification supercedes the previous guide, SHOTCRETE, SPK-3E, dated September 1986, and is for use in the preparation of project specifications.

GENERAL NOTES
Para 1
Para 2

TECHNICAL NOTES
Para A
Para B

TEXT REVISIONS
Para 1

NOTE: A-E's should read all the TECHNICAL NOTES located at the beginning of this guide specification and edit the specification accordingly.

SPK-03362
Apr 1989

GENERAL NOTES

1. This guide specification is to be used in the preparation of contract specifications in accordance with the Sacramento District Specification Manual. It will not be made a part of a contract merely by reference; pertinent portions will be copied verbatim into the contract documents.

2. Where numbers, symbols, words, phrases, clauses, or sentences in this specification are enclosed in the following manner: [ ], a choice or modification must be made; delete inapplicable portion(s) carefully. Where blank spaces occur in sentences, insert the appropriate data. Where entire paragraphs are not applicable, they should be deleted completely.

TECHNICAL NOTES

A. The section number will be inserted in the specification heading and prefixed to each page number in project specifications.

B. Paragraph 1: The listed designations for publications are those that were in effect when this guide specification was being prepared. These designations are updated when necessary by District Instruction, and references in project specifications need be no later than in the current District Instruction for this guide specification. To minimize the possibility of error, the letter suffixes, amendments, and dates indicating specific issues should be retained in Paragraph 1 and omitted elsewhere in the project specification.

SPK-03362
April 1989

INDEX

SECTION 03362

SHOTCRETE

SECTION 03362

SHOTCRETE

1. APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.1 U.S. Army Corps of Engineers Handbook for Concrete and Cement:

CRD-C 300-77 Membrane-Forming Compounds for Curing Concrete.

1.2 American Society for Testing and Materials (ASTM) Standards:

C 42-84a Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.

2. GENERAL: Shotcrete shall be applied as shown on the drawings. Shotcrete is defined as concrete conveyed through a hose and pneumatically projected at high velocity onto a surface, the force of the jet impacting on the surface compacting the materials. It shall be a concrete consisting of cement, sand, coarse aggregate, an accelerating-hardening admixture, and water. The coarse aggregate shall be 3/4-inch maximum size. Shotcrete shall be applied by the dry or wet mix process; which consists of thoroughly mixing the solid materials, adding the accelerating admixture in powder form, feeding these materials by compressed air to a special nozzle, introducing and intimately mixing the water with the other ingredients at the nozzle, and jetting the mixture from the nozzle at high velocity onto the surface. The Contractor may use a liquid accelerator in lieu of powder; provided the liquid is mixed with water by an accurate proportioning pump prior to injection at the nozzle and the dispensing equipment is proved reliable and accurate in quantity measurement throughout the entire workable range of accelerator contents. All products, equipment, and procedures shall be approved by the Contracting Officer. The number of applications, and the thickness of the finished shotcrete coating shall be as shown on the drawings. The shotcrete shall be applied in a single layer. The equipment for shotcrete application shall be capable of handling and applying shotcrete containing the specified maximum size aggregate, and an accelerating-hardening admixture, in a manner satisfactory to the Contracting Officer, and in accordance with these specifications. No aluminum equipment in immediate contact with the shotcrete and shotcrete ingredients will be permitted. Size of hose and typical size of nozzle shall be in accordance with the equipment manufacturer's recommendation. The shotcrete shall meet the compression strength

requirements, as determined by test from test panels, as provided in paragraph: COMPOSTION.

3. MATERIALS:

3.1 Cement: The cement shall be in accordance with SECTION: CONCRETE.

3.2 Sand and Coarse Aggregate: The sand and 3/4-inch size aggregate shall be in conformance with SECTION: CONCRETE.

3.3 Admixtures: The shotcrete shall contain an accelerating-hardening admixture which shall be furnished and added to the mix in powder or liquid form.

4. COMPOSITION: Shotcrete mix design shall be determined by the Contractor, subject to approval of the Contracting Officer. Liquid or powder accelerator shall be accurately proportioned and mixed with water prior to addition to the shotcrete. The mixing machine's operation shall be subject to the approval of the Contracting Officer. The shotcrete shall be proportioned on the basis of either integral sacks or direct weight of cement. In either case, the amount of sand and course aggregate shall be determined by direct weighing. The quantity of admixture used whether in powder or liquid form, shall be based on its amount of solids, proportioned to the unit weight of cement. At least 10 days prior to application of shotcrete, the Contractor shall fabricate 3 test panels. Fabrication of test panels shall consist of applying not less than 4-inches in thickness of shotcrete in one application to a plywood panel not less than 30-inches square. The shotcrete shall be applied to the test panels in the same manner and under the same pressures that will be used in the work. The Contractor will obtain 3-inches minimum diameter cores from the panels and test the cores for compressive strength at 24 hours and 7 days. No shotcrete mixture shall be applied to the work under these specifications until proof has been established that the compressive strength of the mixture, as determined from the test cores, meets the specific strength requirements. Curing of the panel shall be the same as specified for the shotcrete to be applied under these specifications. The panels shall be prepared under the supervision of a Government representative and test results shall be submitted to the Contracting Officer immediately after obtaining test results.

4.1 Test Cores: The test cores shall attain compressive strengths of not less than 800 psi in 24 hours and at least 2,200 psi at 4 days compressive strength. Test of cores shall be covered by application provisions of ASTM C 42.

5. PREPARATION OF SURFACES TO RECEIVE SHOTCRETE: Before the shotcrete is applied, loose material shall be removed from the excavated surfaces. Any surface material which, in the opinion of the Contracting Officer, is damaged, shall be removed to provide a base sufficiently stable to receive the

shotcrete. The surfaces to receive shotcrete shall be rid of moisture prior to application of shotcrete.

6. PLACING: The layer of shotcrete shall be placed up to the minimum thickness as indicated on the drawings. Placement of the shotcrete layer shall be placed immediately after the excavated surfaces have been prepared.

Nozzlemen shall have had at least 6 months experience on equivalent work and shall demonstrate, satisfactorily to the Contracting Officer, ability to perform their duties and to apply shotcrete of the required quality prior to their placing of shotcrete in the work. Dry-mixed ingredients shall be uniformly mixed when discharges from the nozzle. The distance of the nozzleman from the area to shotcrete shall be such as will insure adequate compaction of the shotcrete with neither excessive segregation nor excessive rebound. Re-use of rebound will not be permitted and rebound accumulation shall be removed and disposed of as approved by the Contracting Officer.

7. CURING: All shotcrete shall be moist cured for a minimum of 24 hours after final set. Curing compound meeting CRD C-300 shall then be applied at rate not exceeding 200 square feet per gallon.

8. TEST CORES: The Contractor shall extract diamond-drilled cores from the shotcrete. The cores shall be drilled at the time, depth, and location as determined by the Contracting Officer. The cores shall be drilled normal to the shotcrete surface and full depth of the in-place shotcrete. Special care shall be taken in drilling and handling cores to provide suitable, unbroken, finished test specimens which are reasonable straight, smooth, and in as sound condition as possible from all holes. Three cores shall be taken every 2,000 square feet of construction. One core shall be taken and tested at 24 hours, and two cores taken and tested at 4 days. The Contractor will be required to backfill drill holes in the shotcrete with concrete meeting these specifications.

9. CONSTRUCTION QUALITY CONTROL: Attention is directed to SECTION: CONSTRUCTION QUALITY CONTROL which requires the Contractor to perform quality control inspection, testing, and reporting.

* * * * *

- REMINDER -

Located at the front of these specifications are the Contract Clauses, Special Clauses and Division I GENERAL REQUIREMENTS of the Technical Specifications, which apply to every aspect of this contract including the work in this section whether performed by Prime Contractor, subcontractor, or supplier.